

WHAT IS CLAIMED IS:

1. A system for mitigating intermittent interruptions in an audio radio broadcast system, comprising:

a source of an audio signal;

transmitter means having a first input coupled to said audio source for modulating at least one first carrier signal with said audio signal to broadcast a primary radio signal;

first delay means having an input coupled to said audio source for adding a first predetermined time delay to said audio signal to form a delayed redundant audio signal at an output thereof, said output being coupled to a second input of said transmitter means for modulating at least one second carrier signal with said delayed redundant audio signal to broadcast a delayed redundant radio signal simultaneously with said primary radio signal;

receiver means for receiving said primary radio signal and said delayed redundant radio signal, said

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receiver means demodulating said primary radio signal to provide said audio signal to a first output thereof and demodulating said delayed redundant radio signal to provide said delayed redundant audio signal to a second output thereof, said receiver means including means for detecting degradation of said received primary radio signal, said means for degradation detection providing a quality measurement signal to a third output of said receiver means;

second delay means having an input coupled to said first output of said receiver means for adding a second predetermined time delay to said audio signal to form a delayed primary audio signal at an output thereof, said second predetermined time delay being substantially equal to said first predetermined time delay;

blending means having a first input coupled to an output of said second delay means and second and third inputs respectively coupled to said second and third outputs of said receiver means for combining a first weighting factor with said delayed primary audio signal and

a second weighting factor with said delayed redundant audio signal and combining said weighted delayed primary audio signal with said weighted delayed redundant audio signal to form a composite audio signal, said first weighting factor being smoothly transitioned between a first value and a second value responsive to said quality measurement signal being less than a predetermined threshold value, said second weighting factor being smoothly transitioned between a said second value and said first value responsive to said quality measurement signal being less than said predetermined threshold value; and,

audio output means coupled to said blending means for converting said composite audio signal to an aural signal.

2. The system as recited in Claim 1 where said first predetermined time delay is equal to or greater than 2.0 seconds.

3. The system as recited in Claim 1 further including digital encoding means having an input coupled to said audio source and an output coupled to said first input of said transmitter means.

4. The system as recited in Claim 3 further including digital decoder means having an input coupled to said output of said second delay means and an output coupled to said first input of said blending means.

5. The system as recited in Claim 4 where said means for detecting degradation of said received primary radio signal includes means for determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

6. The system as recited in Claim 4 where said second carrier is at least one FM stereo multiplex subcarrier within an FM broadcast signal spectrum.

7. The system as recited in Claim 6 where said first carrier is at least one subcarrier spaced at least 53 kilohertz from a center frequency of said FM broadcast signal spectrum.

8. The system as recited in Claim 6 where said first carrier is at least one SCA subcarrier of said FM broadcast signal spectrum.

9. The system as recited in Claim 1 where said second carrier is at least one radio frequency signal within an FM broadcast signal spectrum.

10. The system as recited in Claim 9 where said first carrier is at least one SCA subcarrier of said FM broadcast signal spectrum.

11. The system as recited in Claim 1 where said first weighting factor is a function smoothly transitioning between 1.0 and 0.0 responsive to said quality measurement signal being less than said predetermined threshold value, said second weighting factor being a function smoothly transitioning between 0.0 and 1.0 responsive to said quality measurement signal being less than said predetermined threshold value.

12. A method of mitigating intermittent interruptions in an audio radio broadcast, comprising the steps of:

- (a) providing an audio signal;
- (b) modulating at least one first radio frequency signal with said audio signal for transmitting said audio signal as a first radio signal;
- (c) adding a first predetermined time delay to said audio signal to form a delayed redundant audio signal;
- (d) modulating at least one second radio frequency signal with said delayed redundant audio signal for transmitting said delayed redundant audio signal as a second radio signal;
- (e) receiving said first and second radio signals and recovering said audio signal and said delayed redundant audio signal;
- (f) making a quality measurement of at least said received first radio signal;



(g) adding a second predetermined time delay to said recovered audio signal to form a delayed primary audio signal, said second predetermined time delay being substantially equal to said first predetermined time delay;

(h) establishing a first weighting factor, said first weighting factor being equal to 1.0 when said quality measurement is at least as great as a predetermined threshold value and smoothly transitioning to 0.0 over predetermined time period when said quality measurement is less than said predetermined threshold value;

(i) establishing a second weighting factor, said first weighting factor being equal to 0.0 when said quality measurement is at least as great as said predetermined threshold value and smoothly transitioning to 1.0 over said predetermined time period when said quality measurement is less than said predetermined threshold value;

(j) combining said first weighting factor and said delayed primary audio signal, and combining said second weighting factor and said delayed redundant audio signal;

(k) combining said weighted delayed primary audio signal and said weighted delayed redundant audio signal to form a composite audio signal; and

(l) providing an audio output circuit and coupling said composite audio signal thereto.

13. The method as recited in Claim 12 where said step of modulating at least one first radio frequency signal includes the step of digitally encoding said audio signal.

14. The method as recited in Claim 13 where said step of receiving includes the step of decoding said recovered audio signal.

15. The method as recited in Claim 12 where said step of adding a first predetermined time delay includes the step of selecting a time delay within the approximating range of 2.0 - 5.0 seconds.

16. The method as recited in Claim 14 where the step of modulating at least one first radio frequency signal includes the step of modulating at least one subcarrier spaced within the approximating range of 130 - 199 kilohertz from a center frequency of an FM broadcast signal spectrum with said digitally encoded audio signal.

17. The method as recited in Claim 16 where the step of modulating at least one second radio frequency signal includes the step of modulating at least one radio frequency signal within an FM broadcast signal spectrum with said delayed redundant audio signal.

18. The method as recited in Claim 16 where the step of modulating at least one second radio frequency signal includes the step of modulating at least one SCA subcarrier of said FM broadcast signal spectrum with said delayed redundant audio signal.

19. The method as recited in Claim 12 where said step of making a quality measurement includes the step of determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

20. A method of mitigating intermittent interruptions in an in-band on-channel digital audio broadcast system, wherein each channel includes at least one carrier signal modulated with an analog audio signal and a plurality of subcarriers modulated with a digital representation of the analog audio signal, comprising the steps of:

(a) adding a predetermined first time delay to the analog audio signal prior to modulation of the at least one carrier signal, the analog audio signal being delayed relative to the digital representation of the analog audio signal;

(b) providing a receiver for receiving both said at least one modulated carrier signal and said modulated subcarriers to recover said delayed analog audio signal and said digital representation of the analog audio signal;

(c) detecting a predetermined level of degradation in said digital representation of the analog audio signal;

(d) adding a predetermined second time delay to said digital representation of the analog audio signal and converting said delayed digital representation of the analog audio signal to form a primary audio signal; and,

(e) substituting said delayed analog audio signal for said primary audio signal when said predetermined level of degradation is detected.